similarly with the existing powder metallurgy process, the magnetostrictive material deteriorates in characteristics. Furthermore, crystallographic direction of anisotropic magnetostrictive alloy cannot be sufficiently aligned, resulting in only an isotropic sintered body. This causes deterioration of magnetostriction. The quenching process of the molten alloy in Japanese Patent Publication (KOKAI) No. HEI 1-246342 is implemented with an intention to make grain diameter finer.

Page 9, delete the partial paragraph starting on line 1, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

alloy of which primary components are rare earth and transition elements, and nitrogen contained in the mother alloy. Here, the nitrogen is interstitially dissolved in the mother alloy, a content of nitride in the mother alloy, as a ratio of a content of nitrogen contained in the nitride to a total content of nitrogen in the mother alloy, being 0.05 or less by mass ratio.

Page 9, delete the second full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

B3

In the first giant magnetostrictive material of the present invention, the mode of the magnetostrictive alloy is not particularly restricted, but various kinds of alloy materials for instance such as unidirectionally solidified material, single crystal, quenched molten metal, sintered body prepared by powder metallurgy, or isotropic cast material can be used. Furthermore, an alloy thin film due to thin film deposition may be used.

Page 10, delete the first full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

B4

In the method of manufacturing the first giant magnetostrictive material, further in the step of adding nitrogen, the nitrogen is controlled to be contained in the mother alloy in the range from 0.01 to 2.5% by mass, and a content of nitride in the mother alloy, by a mass ratio of a content of nitrogen contained in the nitride to a total content of nitrogen in the mother alloy, to be 0.05 or less.

Page 14, delete the first full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

B5

In the second giant magnetostrictive material, the melt quench flakes contain the columnar structure grains extending in a thickness direction, more specifically is preferable to contain the columnar structure grains of 70% or more by volume ratio. Furthermore, the crystallographic direction in the thickness direction of the columnar structure grains mainly constituting the melt quench flakes is preferable to be approximate {1,1,0} or {1,1,1}. As to the crystallographic direction of the columnar grain here, when the columnar structure grains grow in a direction of <110> or <111>, such a direction of crystal growth needs only to be within ± 45 degrees with respect to a thickness direction of the flake material. Furthermore, it is preferable to contain 75% or more by volume of the columnar structure grains satisfying such condition.

Page 14, delete the last paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

B6

However, even if the nitrogen content is optimized, when much of the added nitrogen forms the nitrides such as rare earth nitride or iron nitride, in spite of an increase of the Curie temperature, there occur problems in not only magnetostriction but also in mechanical reliability. That is, when the temperature is too high during the nitrogen addition, the nitride tends to form easily to cause a change in the crystal structure, resulting in deterioration

Please delete page 20 and replace with the following in accordance with 37 CFR § 1.121.

magnetostriction. Furthermore, an increase of the generated nitrogen compound or excessive nitridation causes an increase of internal strain, on the basis thereof the mechanical characteristics being adversely affected. In the worst case, self-breakdown may occur.

From the above, in the present giant magnetostrictive material, first an amount of the nitride present in the magnetostrictive alloy, by a ratio (mass ratio) of a content

of nitrogen contained in the nitride to a total content of nitrogen in the alloy, is reduced to be 0.05 or less. That is, the content of the nitrogen contained in the nitrogen compound is made 5% or less by mass to the total content of nitrogen in the alloy. In other words, nitrogen of 95% or more by mass of the total content of nitrogen added to the magnetostrictive alloy is interstitially dissolved in the primary phase of the magnetostrictive alloy as nitrogen atom.

As mentioned in the above, by controlling the formation of the nitrogen compound and dissolving interstitially most of the added nitrogen in the primary phase, while suppressing the crystal structure useful for magnetostriction from breaking down and the mechanical characteristics from deteriorating accompanying the formation of the nitride, an increase effect of the Curie temperature due to nitrogen addition can be effectively obtained.

That is, when the content of nitrogen contained in the nitride exceeds 0.05 by a mass ratio with

Page 21, delete the partial paragraph starting on line 1, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

respect to the total content of nitrogen in the alloy, based on the amount of formation of the nitride, deterioration of magnetostriction or mechanical characteristics is caused. The amount of the generated nitride is preferably controlled to be 0.03 or less by the mass ratio with respect to the total amount of nitrogen contained therein. As to the interstitial introduction of the nitrogen, as explained below, it is effective to lower the temperature when adding nitrogen, specifically the nitrogen addition under a low temperature environment such as 600°C or less.

Please delete page 22 and replace with the following in accordance with 37 CFR § 1.121.

fusion-thermalconductivity method). A content of nitrogen dissolved interstitially in the rare earth-transition metal alloy (mother alloy) denotes a value obtained by averaging nitrogen concentrations (excluding the nitrogen content present as the nitride) measured by line profile analysis by means of EPMA (Electron Probe Microanalyzer). The nitrogen

content contained in the nitride in the alloy is a value obtained by subtracting the interstitial nitrogen content measured by EPMA (average value of the concentrations of nitrogen interstitially dissolved in the mother alloy) from the total nitrogen content measured by LECO analyzer.

More specifically, by analyzing the nitrogen content of the giant magnetostrictive material using LECO method, the total nitrogen content in the giant magnetostrictive material can be obtained. Then, the nitrogen content in the giant magnetostrictive material is measured by the line profile analysis using EPMA. In measurements due to the EPMA line profile analysis, a total area thereof is the total nitrogen content in the giant magnetostrictive material. This corresponds to the measurement using the analysis by LECO analyzer. In the line profile analysis using the EPMA, when the nitrogen compound is present, a peak appears as a singular point. Accordingly, by subtracting an area of the singular point from the total area, a concentration of nitrogen dissolved as simple nitrogen in the mother alloy can be obtained as an average value. The value is assigned as the nitrogen content dissolved interstitially in the rare earth-transition metal alloy.

Page 23, delete the first full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

In the first giant magnetostrictive material of the present invention, the dispersion of the content of the interstitially dissolved nitrogen (the nitrogen concentration excluding the nitrogen content present as the nitride) is preferable to be within ± 30% with respect to the value averaged over the entire alloy. The dispersion of the dissolved nitrogen over the entire magnetostrictive material is obtained based on the results of the line profile analysis using the EPMA.

Page 26, delete the first full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

In the present first giant magnetostrictive material, the nitrogen in the range where temperature characteristics and magnetostriction are compatible is interstitially dissolved between the crystal lattice, thereby the nitrogen content present as the nitride being largely reduced. Accordingly, while maintaining excellent magnetostriction and

mechanical reliability, even under an environment exceeding for instance 100° C, such magnetostriction can be fully exhibited.

Page 28, delete the first and second paragraphs, and replace these paragraphs with the following in accordance with 37 CFR § 1.121.

nitrogen, or by mechanical alloying in an atmosphere containing nitrogen. Anyway, it is important to implement the nitrogen addition treatment in a temperature region of 600° C or less. By implementing the nitrogen addition treatment in such temperature region, nitrides such as rare earth nitride or iron nitride due to the added nitrogen can be prevented from occurring. In other words, the added nitrogen can be effectively introduced interstitially between the crystal lattice of the alloy. When the temperature during the nitrogen addition treatment exceeds 600° C, the nitride is rapidly increased in its amount.

The process of nitrogen addition will be detailed. When applying heat treatment to add nitrogen, rare earth-transition metal base alloy materials prepared by the use of various methods are preferably heat treated in an atmosphere containing nitrogen in the range of temperature from 200 to 600° C. Appropriate heat treatment conditions differ in accordance with the kind of alloy, kind of gas and atmospheric condition such as partial pressure of gas. However, when heat treating at a temperature exceeding 600° C, the nitrogen compound is formed greatly.

Page 29, delete the last paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

When applying the mechanical alloying method as the nitrogen addition treatment, to the rare earth-transition metal base alloy materials prepared due to the aforementioned various methods, the mechanical alloying is implemented in an atmosphere containing nitrogen at a temperature region less than 600° C. In the mechanical alloying, due to rotation of hard spheres, metal powder is repeatedly milled and compressed as if kneading. At that time, the nitrogen can be included in the alloy. Even in such mechanical alloying process, by setting an atmospheric temperature at 600° C or less, the nitride can be largely suppressed from

Page 30, delete the second full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

In the nitrogen addition process, when a portion of high nitrogen concentration is locally formed in the alloy, the nitride may be formed, a change of crystal structure may be caused. Accordingly, in order to suppress nonuniformity of the nitrogen concentration from occurring, depending on the kind or state of the material to treat, kind of gas, pressure of gas, mixing ratio of gas and heat treatment temperature and time for nitrogen addition are preferable to be adjusted.

Page 32, delete the last paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

When using anisotropic giant magnetostrictive material is employed, it is preferable for the crystallographic direction to be oriented. More specifically, in the case of the unidirectionally solidified material being used, in grains of 80% by volume or more of entire material, the crystallographic direction in a direction of an applied magnetic field (direction of which magnetostriction is used) is preferable to orient within ± 45 degrees from <111> or <110>. In other words, in 80% by volume or more of grains of the entire material, <111> or <110> direction thereof

Page 33, delete the second full paragraph, and replace this paragraph with the following in accordance with 37 CFR § 1.121.

In the case of single crystal being used, the crystallographic orientation in a direction of applied magnetic field (direction of which magnetostriction is used) is preferable to be oriented within ± 45 degrees from <111> or <110>. At that time, the range of angle is more preferable to be within ± 30 degrees, still more preferable to be within ± 15 degrees. Thereby, similarly with the unidirectionally solidified material, the magnetostriction of the giant magnetostrictive material can be exhibited.

Please delete page 36 and replace with the following in accordance with 37 CFR § 1.121.

in that state. In the drawing, an arrow mark is a grain growth direction of the melt quench flake material 1, by applying a magnetic field in this direction, large magnetostriction being obtained.

The crystallographic direction in a thickness direction of the columnar structure that mainly constitute the melt quench flake material 1 is preferable to be approximate <111> or approximate <110>. These crystallographic directions are ones large in magnetostriction. As the crystallographic directions of the columnar structure deviate from <111> or <110>, the magnetostriction in a direction to use decreases. The crystallographic direction of the columnar structure here, when the columnar structure grow in a direction of <111> or <110>, needs only for such grain growth direction to be within ± 45 degrees with respect to the thickness direction of the flake material 1. The melt quench flake material 1 needs only to contain the columnar structure satisfying such conditions by 75% by volume or more.

The grain growth direction (for example, <110> or <111>) of the aforementioned columnar structure is more preferable to be within ± 30 degrees with respect to the thickness direction of the flake material 1, still more preferable to be within ± 20 degrees. Furthermore, the volume ratio of the columnar structure satisfying the above crystallographic direction conditions is more preferable to be 80% or more by volume, still more preferable to be 85% or more, desirably to be 90% or more.

On page 48, please delete line 1 and the first full paragraph and replace with the following in accordance with 37 CFR § 1.121.:

within ± 30 degrees from <110>.

Nitrogen contents (total nitrogen content) of the respective alloy materials after the nitrogen addition treatment are measured by means of LECO analysis, measurements being 0.1% by mass, 1.0% by mass and 1.5% by mass, respectively. Contents of nitrogen (average value) dissolved interstitially in the respective alloy materials are measured by means of EPMA, being 0.099% by mass, 0.99% by mass and 1.47% by mass, respectively. Furthermore, presence of nitride is checked by X-ray diffractometer to be found that in the test piece of which nitrogen content (total nitrogen content) is 1.5% by mass, nitride is confirmed to form. However, when, from a

value that is obtained by subtracting the interstitially dissolved nitrogen content from the total nitrogen content, a ratio of the nitrogen content contained in the nitride to the total nitrogen content is calculated, it is found to be such slight value as 0.02.

On page 50, delete the Table 1 Header and replace with the following in accordance with 37 CFR § 1.121.

No.	Composition (atomic ratio)	Nitrogen content (% by mass)	Ratio of nitrogen in nitride	Magneto-striction	Curie temperature